

Appl. No. 10/065,665
Amdt. dated March 29, 2006
Reply to Office action of December 29, 2005

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Amendments to the Claims:

Listing of Claims:

Claim 1 (currently amended): A method of driving a liquid crystal display (LCD) device,
5 the method comprising:

(a-0) providing the LCD device with an LCD panel for displaying a plurality of pixels
arranged in a matrix format, a voltage selection circuit for outputting a plurality
of driving voltage levels according to display data, a timing controller, and a
plurality of output buffers, each output buffer electrically coupled between the
10 voltage selection circuit and the LCD panel;

(a) driving pixels located in a row by corresponding output buffers according to
corresponding driving voltage levels generated from the voltage selection circuit;

(b) disconnecting the pixels from the corresponding output buffers; and

(c) connecting the pixels driven by the same driving voltage level for equalizing
15 voltages applied on the pixels, and turning off [[the]] operating voltages inputted
into the corresponding output buffers for stopping the output buffers from
processing the corresponding driving voltage levels;

wherein the timing controller controls the driving sequence of steps (a), (b), and (c), and
the timing controller comprises: a frequency divider for dividing the frequency of a clock
20 signal according to a predetermined divisor; a counter for counting the divided clock
signal to generate a count value; a comparator for comparing the count value with a
predetermined number to generate a comparison result; and a logic controller comprising
a first input port for receiving the comparator result to determine timing to perform steps
(b) and (c).

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Claim 2 (cancelled)

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Claim 3 (original): The method of claim 1, wherein each output buffer is an operational amplifier.

5 Claim 4 (original): The method of claim 1, wherein the voltage selection circuit comprises a plurality of conductive wires each for carrying one of the driving voltage levels and a plurality of digital-to-analog decoders (DACs) each for selecting one of the driving voltage levels from the conductive wires according to display data.

10 Claim 5 (previously presented): The method of claim 4, wherein the LCD device further comprises a plurality of switches each selectively connecting an output terminal of the output buffer to a corresponding pixel or connecting an input terminal of the output buffer, to a corresponding pixel.

Claim 6 (previously presented): The method of claim 5, wherein step (a) is performed by connecting the output terminal of the output buffer to the corresponding pixel.

Claim 7 (previously presented): The method of claim 5, wherein step (b) is performed by connecting the input terminal of the output buffer to the corresponding pixel.

15 Claim 8 (original): The method of claim 5, wherein step (c) the pixels predetermined to be driven to the same driving voltage level are connected to the same conductive wire which delivers corresponding driving voltage level.

20 Claim 9 (previously presented): The method of claim 1, wherein the LCD device further comprises:
a plurality of first switches each connected between an output terminal of a corresponding output buffer and a corresponding pixel; and
a plurality of second switches each connected between two pixels for selectively connecting the two pixels.

25 Claim 10 (original): The method of claim 9, wherein step (a) is performed by: turning on

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each first switch in the row for connecting the output buffer to the corresponding pixel; and turning off each second switch in the row.

5 Claim 11 (original): The method of claim 9, wherein step (b) is performed by turning off each first switch in the row.

Claim 12 (original): The method of claim 9, wherein step (c) is performed by selectively turning on the second switches on the row.

10 Claim 13 (original): The method of claim 1, wherein the LCD device further comprises a timing controller for controlling the driving sequence of steps (a), (b), and (c).

Claim 14 (cancelled)

15 Claim 15 (currently amended): The method of claim 14 1, wherein when the count value is equal to the predetermined number, the comparison result generates a voltage level transition, and step (b) and step (c) are performed.

20 Claim 16 (currently amended): The method of claim 14 1, wherein the frequency divider comprises an input port for receiving an input data to set the predetermined divisor.

Claim 17 (currently amended): The method of claim 14 1, wherein the comparator comprises an input port for receiving an input data to set the predetermined number.

25 Claim 18 (cancelled)

Claim 19 (currently amended): The method of claim 14 1, wherein the logic controller further comprises a second input port for receiving an external clock signal, and the logic

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controller determines whether to perform steps (b) and (c) according to the external clock signal.

5 Claim 20 (original): The method of claim 19, wherein the logic controller further comprises a third input port for receiving a selecting signal, and the selecting signal is used for controlling the logic controller to adopt either the comparison result or the external clock signal.

10 Claim 21 (previously presented): A liquid crystal display (LCD) device comprising:
an LCD panel for displaying a plurality of pixels arranged in a matrix format;
a voltage selection circuit for outputting a plurality of driving voltage levels according to display data;
a plurality of output buffers, each output buffer electronically coupled between the voltage selection circuit and the LCD panel for driving the corresponding pixel by
15 corresponding driving voltage level; and
a timing controller for controlling driving of the pixels, the timing controller comprising:
a frequency divider for dividing the frequency of a clock signal according to a predetermined divisor;
a counter for counting the divided clock signal to generate a count value; and
20 a comparator for comparing the count value with a predetermined number;
wherein the output buffers are disconnected from the corresponding pixels, operating voltages inputted into the output buffers are turned off, and the pixels that are driven by the same driving voltage levels are connected for averaging the voltage applied on the pixels according to the predetermined number.

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Claim 22 (original): The LCD device of claim 21, wherein the frequency divider comprised an input port for receiving an input data to set the predetermined divisor.

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Claim 23 (original): The LCD device of claim 21, wherein the comparator comprises an input port for receiving an input data to set the predetermined number.

5 Claim 24 (original): The LCD device of claim 21 wherein the timing controller further comprises a logic controller, and the logic controller comprises a first input port for receiving a comparison result outputted from the comparator to determine whether the count value is equal to the predetermined number or not.

10 Claim 25 (original): The LCD device of claim 24 wherein the logic controller further comprises a second input port for receiving a control signal, and the logic controller determines whether the output buffers are disconnected from the corresponding pixel, and the pixels that are driven by the same driving voltage level are connected for averaging the voltage inputted into the pixels according to the control signal.

15 Claim 26 (original): The LCD device of claim 25 wherein the logic controller further comprises a third input port for receiving a selecting signal, and the selecting signal is used for controlling the logic controller to adopt either the comparison result or the control signal.

20 Claims 27 and 28 (cancelled)

Claim 29 (currently amended): A driving device for driving a liquid crystal display (LCD) device, the LCD device comprising an LCD panel having a plurality of pixels arranged in a matrix format, said driving device comprising:
25 a plurality of decoders each for selectively outputting one of a plurality of voltages according to display data;
a plurality of driving units each electrically connected to one of said decoders, said driving unit comprising:

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an output buffer;
a first switch connected between an output terminal of said output buffer
and an output terminal of said driving unit, the output terminal of
said output buffer being electrically connected to the output terminal
5 of said driving unit when said first switch is turned on; and
a second switch connected between the output terminal of said driving
unit and an output terminal of another driving unit, the output
terminal of said driving unit being electrically connected to the
output terminal of another driving unit when said second switch is
10 turned on;
wherein said first switch is first turned on to drive an output voltage of
said driving unit toward a voltage from corresponding decoder, and
during a display data driving period, said second switch is then
selectively turned on to drive the output voltage of said driving units
15 toward an average voltage generated from averaging voltages at output
terminals of said driving units.

Claim 30 (currently amended): A driving device for driving a flat panel display including
a plurality of pixels arranged in a matrix format, said driving device comprising:
20 a first driving units receiving a first voltage and being provided to drive
the pixels of the flat panel display, said first driving unit
comprising:
a first output buffer;
a first switch electrically connected between an output terminal of
25 said first output buffer and an output terminal of said first
driving unit;
a second driving units receiving a second voltage and driving the
pixels of the flat panel display, said second driving unit

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- comprising:
- a second output buffer;
 - a second switch electrically connected between an output terminal of
 said second output buffer and an output terminal of said second
 - 5 driving unit;
 - a third switch electrically connected between the output terminal of
 said first driving unit and the output terminal of said second
 driving unit; and
 - a detecting circuit for ~~controlling~~ selectively turning on said third
 - 10 switch according to the first voltage and the second voltage.

Claim 31 (original): The driving device of claim 30, said third switch is turned on if the
 first voltage and the second voltage are substantially the same.

- 15 Claim 32 (currently amended): A driving device for driving a flat panel display including
 a plurality of pixels arranged in a matrix format, said driving device comprising:
- a first driving units receiving a first input driving data and being
 provided to drive the pixels of the flat panel display according to
 said first input driving data, said first driving unit comprising:
 - 20 a first output buffer;
 - a first switch electrically connected between an output terminal of
 said first output buffer and an output terminal of said first
 driving unit;
 - a second driving units receiving a second input driving data and
 being provided to drive the pixels of the flat panel display
 according to said second input driving data, said second driving
 unit comprising:
 - 25 a second output buffer;

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- 5 a second switch electrically connected between an output terminal of
said second output buffer and an output terminal of said second
driving unit;
a third switch electrically connected between the output terminal of
said first driving unit and the output terminal of said second
driving unit; and
a detecting circuit for controlling selectively turning on said third
switch according to the first input driving data and the second
input driving data.

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Claim 33 (original): The driving device of claim 32 wherein said third
switch is turned on if the first input driving data and the second input
driving data are the same.

- 15 Claim 34 (currently amended): A method of driving a liquid crystal display (LCD) device,
the method comprising:
providing the LCD device with an LCD panel for displaying a plurality of pixels
arranged in a matrix format, a voltage selection circuit for outputting a plurality of
driving voltage levels according to display data, a plurality of output buffers, a
20 plurality of first switches, and a plurality of second switches, each output buffer
electrically coupled between the voltage selection circuit and the LCD panel,
each first switch coupled between an output terminal of a corresponding output
buffer and a corresponding pixel, and each second switch connected between
corresponding two pixels for selectively connecting the corresponding two pixels;
25 controlling the first switches for connecting the pixels to the corresponding output
buffers;
driving pixels located in a row by corresponding output buffers according to
corresponding driving voltage levels generated from the voltage selection circuit;

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controlling the first switches for disconnecting the pixels from the corresponding
output buffers; and
5 during a display data driving period, controlling the second switches for connecting
the pixels driven by the same driving voltage level for equalizing voltages applied
on the pixels.

Claim 35 (previously presented): A method of driving a liquid crystal display (LCD)
device, the method comprising:

- 10 (a) providing the LCD device with a timing controller, an LCD panel for displaying a
plurality of pixels arranged in a matrix format, a voltage selection circuit for
outputting a plurality of driving voltage levels according to display data, and a
plurality of output buffers, each output buffer electrically coupled between the
voltage selection circuit and the LCD panel;
- 15 (b) driving pixels located in a row by corresponding output buffers according to
corresponding driving voltage levels generated from the voltage selection circuit;
- (c) disconnecting the pixels from the corresponding output buffers;
- (d) connecting the pixels driven by the same driving voltage level for equalizing
voltages applied on the pixels; and
- 20 (e) controlling driving sequence of steps (b), (c), and (d) through the timing controller,
wherein the timing controller comprises a frequency divider receiving an input data to
set a predetermined divisor for dividing the frequency of a clock signal according to
the predetermined divisor, a counter for counting the divided clock signal to generate a
count value, and a comparator for comparing the count value with a predetermined
number to generate a comparison result.

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Claim 36 (previously presented): A method of driving a liquid crystal display (LCD)
device, the method comprising:

- (a) providing the LCD device with a timing controller, an LCD panel for displaying a

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- plurality of pixels arranged in a matrix format, a voltage selection circuit for outputting a plurality of driving voltage levels according to display data, and a plurality of output buffers, each output buffer electrically coupled between the voltage selection circuit and the LCD panel;
- 5 (b) driving pixels located in a row by corresponding output buffers according to corresponding driving voltage levels generated from the voltage selection circuit;
- (c) disconnecting the pixels from the corresponding output buffers;
- (d) connecting the pixels driven by the same driving voltage level for equalizing voltages applied on the pixels; and
- 10 (e) controlling driving sequence of steps (b), (c), and (d) through the timing controller, wherein the timing controller comprises a frequency divider for dividing the frequency of a clock signal according to the predetermined divisor, a counter for counting the divided clock signal to generate a count value, a comparator for comparing the count value with a predetermined number to generate a comparison
- 15 result, and a logic controller having a first input port for receiving the comparator result to determine timing to perform steps (b) and (c).

- Claim 37 (previously presented): A liquid crystal display (LCD) device comprising:
- an LCD panel for displaying a plurality of pixels arranged in a matrix format;
- 20 a voltage selection circuit for outputting a plurality of driving voltage levels according to display data;
- a plurality of output buffers, each output buffer electronically coupled between the voltage selection circuit and the LCD panel for driving the corresponding pixel by corresponding driving voltage level; and
- 25 a timing controller for controlling driving of the pixels, the timing controller comprising:
- a frequency divider for receiving an input data to set a predetermined divisor and for dividing the frequency of a clock signal according to the predetermined divisor;
- a counter for counting the divided clock signal to generate a count value; and

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a comparator for comparing the count value with a predetermined number;
wherein the output buffers are disconnected from the corresponding pixels, and the pixels
that are driven by the same driving voltage levels are connected for averaging the voltage
applied on the pixels according to the predetermined number.

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Claim 38 (previously presented): A liquid crystal display (LCD) device comprising:

an LCD panel for displaying a plurality of pixels arranged in a matrix format;
a voltage selection circuit for outputting a plurality of driving voltage levels according to
display data;
10 a plurality of output buffers, each output buffer electronically coupled between the voltage
selection circuit and the LCD panel for driving the corresponding pixel by
corresponding driving voltage level; and
a timing controller for controlling driving of the pixels, the timing controller comprising:
a frequency divider for dividing the frequency of a clock signal according to the
15 predetermined divisor;
a counter for counting the divided clock signal to generate a count value;
a comparator for comparing the count value with a predetermined number; and
a logic controller for receiving a comparison result outputted from the comparator to
determine whether the pixels driven by the same driving voltage levels are
20 connected for averaging the voltage applied on the pixels or not.

Claim 39 (currently amended): A driving device for driving a display panel including a

plurality of pixels arranged in a matrix format, the driving device comprising:
a voltage selection circuit for outputting a plurality of driving voltage levels according to
25 display data;
a plurality of output buffers, each output buffer coupled between the voltage selection
circuit and the display panel for driving the corresponding pixel by corresponding
driving voltage level;

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a plurality of first switch circuits each coupled between an output terminal of a
corresponding output buffer and a corresponding pixel;
a plurality of second switch circuits each coupled between two pixels for selectively
connecting the two pixels; and
5 a control circuit, selectively turning on ~~controlling~~ the second switch circuit to connect
the two pixels according to ~~to~~ corresponding display data or the corresponding driving
voltage level.

Claim 40 (previously presented) A method of driving a liquid crystal display (LCD)
10 device, the method comprising:
(a-0) providing the LCD device with:
an LCD panel for displaying a plurality of pixels arranged in a matrix format;
a voltage selection circuit for outputting a plurality of driving voltage levels
according to display data;
15 a timing controller comprising a frequency divider for dividing a frequency of a
clock according to a predetermined divisor, a counter for counting the divided
clock signal to generate a count value, a comparator for comparing the count
value with a predetermined number to generate a comparison result, and a logic
controller; and
20 a plurality of output buffers, each output buffer electrically coupled between the
voltage selection circuit and the LCD panel;
(a) driving pixels located in a row by corresponding output buffers according to
corresponding driving voltage levels generated from the voltage selection circuit;
(b) disconnecting the pixels from the corresponding output buffers;
25 (c) connecting the pixels driven by the same driving voltage level for equalizing
voltages applied on the pixels, and turning off the operating voltages inputted into
the corresponding output buffers; and
(d) utilizing the timing controller for controlling the driving sequence of steps (a), (b),

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and (c), wherein the logic controller comprises a first input port for receiving the comparator result to determine timing to perform steps (b) and (c).

Claim 41 (previously presented): A liquid crystal display (LCD) device comprising:

- 5 an LCD panel for displaying a plurality of pixels arranged in a matrix format;
 a voltage selection circuit for outputting a plurality of driving voltage levels according to display data;
 a plurality of output buffers, each output buffer electronically coupled between the voltage selection circuit and the LCD panel for driving the corresponding pixel by
10 corresponding driving voltage level; and
 a timing controller for controlling driving of the pixels, the timing controller comprising:
 a frequency divider for dividing the frequency of a clock signal according to a predetermined divisor;
 a counter for counting the divided clock signal to generate a count value;
15 a comparator for comparing the count value with a predetermined number; and
 a logic controller comprising a first input port for receiving a comparison result outputted from the comparator to determine whether the count value is equal to the predetermined number or not;
 wherein the output buffers are disconnected from the corresponding pixels, operating
20 voltages inputted into the output buffers are turned off, and the pixels that are driven by the same driving voltage levels are connected for averaging the voltage applied on the pixels according to the predetermined number.